Listing of Claims:

1. **(Currently Amended)** A method for optimizing radiographic image quality of a single x-ray image of an object that is produced by irradiating the object with x-rays from an x-ray apparatus during an x-ray exposure period, the x-ray apparatus including an x-ray source configured to generate x-rays directed towards and through said object and an x-ray imaging system configured to receive x-rays that have been emitted from the x-ray source and have passed through the object, the x-ray source including an electron source and an x-ray emissive target, the method comprising:

A. determining a first operating voltage level kVp_0 of the x-ray source for initial operation of the x-ray apparatus;

B. during a first sampling interval Δt_1 in the beginning of the x-ray exposure period, operating the x-ray source in the x-ray apparatus at said first operating voltage level kVp_0 and using one or more sensors to detect x-rays that have passed through a portion of the object during the interval Δt_1, the sensors disposed between the object and the x-ray imaging system, wherein the first sampling interval Δt_1 is relatively small compared to the x-ray exposure period, wherein the x-ray exposure period is a length of time during which said object must be irradiated with the x-rays in order for said single x-ray image of said object to be generated;

C. after said first sampling interval Δt_1, processing the output signals from said sensors to determine a second operating voltage level kVp_1 of the x-ray source;

D. during a second sampling interval Δt_2 within the same x-ray exposure period, wherein the object is irradiated with x-rays from the x-ray apparatus during said x-ray exposure period to generate said single image of the object, operating the x-ray source of said x-ray apparatus at said second operating voltage level kVp_1 and using said sensors to detect x-rays that have passed through a portion of the object during the interval Δt_2, wherein the second sampling interval Δt_2 is also relatively small compared to the x-ray exposure period for said single image of the object; and

E. after said second sampling interval Δt_2, processing the sensor output signals to determine an optimal value kVp_2 for the operating voltage level, and setting the operating voltage level of the x-ray source of the x-ray apparatus to said optimal value kVp_2 for the

remainder of the x-ray exposure period of the single image of the entire object.

2. (canceled)

3. (canceled)

4. (Previously Presented) A method in accordance with claim 1, further comprising:

determining the optimal values of one or more additional x-ray exposure parameters of the x-ray apparatus, and setting said additional x-ray exposure parameters to said optimal values for the remainder of the x-ray exposure period.

5. (Original) A method in accordance with claim 4, wherein said additional x-ray exposure parameters comprise at least one of: x-ray tube current (mA), size of focal spot, and number and type of soft x-ray filters; and wherein said x-ray tube current is the current formed by electrons emitted from said electron source, said focal spot is the area within said target upon which the electrons impinge, and said soft x-ray filters are filters for absorbing soft x-ray radiation.

6. (canceled)

7. (Original) A method in accordance with claim 1, wherein said object comprises anatomical tissue of a patient, and wherein said optimal value of said operating voltage are chosen so that the patient's exposure to x-rays is substantially minimized when the x-ray apparatus is operated at said optimal value.

8. (Original) A method in accordance with claim 1, further comprising an x-ray imaging system, and wherein said x-ray imaging system comprises one of: a) a radiographic film defining an image plane; and b) a flat panel detector configured to detect x-rays that have passed through said object, said flat panel detector being disposed along an image plane.

9. (original) A method in accordance with claim 8,

wherein said one or more sensors are positioned between said object and said image

plane.

10. (original) A method in accordance with claim 9, wherein a plurality of sensors are used to detect x-rays during said first and second sampling intervals, and wherein each of said plurality of sensors are positioned at different locations so that said sensors can detect x-rays that have traversed different portions of said object.

11. (original) A method in accordance with claim 1, wherein said object comprises anatomical tissue of a patient, and further comprising the step of measuring the thickness of said tissue before the step of determining said first and second operating voltage levels.

12. (original) A method in accordance with claim 11, wherein the step of determining said optimal value of said operating voltage level comprises:

A. calculating the differential attenuation coefficient $\Delta\mu$ of the exposed tissue at said voltage level kVp_1, based on the output signals from said sensors, and based on the measured thickness of said tissue;

B. creating at least one $\Delta\mu$ table for at least one region of said object;

C. determining the composition of said tissue using said calculated value of $\Delta\mu$, and said at least one $\Delta\mu$ table; and

D. determining said optimal value of said operating voltage level, using said tissue composition and said $\Delta\mu$ table.

13. (original) A method in accordance with claim 12, wherein at least one $\Delta\mu$ table is created in step B for every centimeter of breast tissue, and wherein each of said at least one $\Delta\mu$ table defines at least two kVp values for said sampling intervals, and at least three $\Delta\mu$ values for at least three breast tissue compositions.

14. (original) A method in accordance with claim 4, wherein determining said optimal values of said additional x-ray parameters comprises:

A. calculating the differential attenuation coefficient $\Delta\mu$ of the exposed tissue at said

voltage level kVp_1, based on the output signals from said sensors, and based on the measured thickness of said tissue;

B. creating at least one $\Delta\mu$ table for at least one region of said object;

C. determining the composition of said tissue using said calculated value of $\Delta\mu$, and said at least one $\Delta\mu$ table; and

D. determining said optimal values of said additional x-ray parameters using said tissue composition and said $\Delta\mu$ table.

15. (original) A method in accordance with claim 1, wherein steps B and C are repeated for a plurality of n sampling intervals $\Delta t_1^1, \ldots, \Delta t_1^n$, during which the x-ray apparatus is operated at corresponding operating voltage levels $kVp_1^1, \ldots kVp_1^n$, so that said optimal operating voltage level kVp_2 is determined based on sensor output signals generated while the x-ray apparatus was operated at voltage level kVp_1^n during a sampling interval Δt_1^n

16. (previously presented) An x-ray imaging apparatus, the x-ray imaging apparatus comprising:

an x-ray source adapted to generate x-rays directed towards and through an object, the x-ray source including an electron source configured to emit electrons, and an x-ray emissive target configured to emit x-rays from a focal spot within the target in response to incident electrons that have been accelerated from said electron source toward said target at an operating voltage of said x-ray source;

an x-ray imaging system configured to receive x-rays that have been emitted from said x-ray source and that have passed through said object, and to generate an image of said object from the received x-rays;

one or more sensors disposed between the object and said x-ray imaging system, said sensors being configured to detect x-rays from said x-ray source that have traversed said object during a first sampling period Δt_1 and a second sampling period Δt_2, and to generate one or more output signals representative of the attenuated intensity of the detected x-rays, wherein the first sampling period and the second sampling period are each relatively small compared to the total exposure time during which said object is exposed to radiation generated by said x-ray source;

a processor configured to determine a first operating voltage level kVp_0 of the x-ray

source for an initial operation of said x-ray apparatus during said first sampling period Δt_1, said processor being further configured to calculate, after said first sampling period Δt_1, a second operating voltage level kVp_1 of the x-ray source by processing the output signals generated by said sensors during said first sampling period, said processor being further configured to calculate, after said second sampling period Δt_2, an optimal operating voltage level kVp_2 of the x-ray source_by processing the output signals generated by said sensors during said second sampling period; and

a controller configured to adjust the operating voltage of said x-ray source to said first and second operating voltage levels during said first and second sampling periods, respectively, said controller being further configured to adjust, after said second sampling period Δt_2, the operating voltage of said x-ray source to said optimal voltage level kVp_2 for the remainder of said x-ray exposure period.

17. (canceled)

18. (Previously presented) An x-ray apparatus in accordance with claim 16, wherein said processor is further configured to determine the optimal values of one or more x-ray exposure parameters, and wherein said x-ray exposure parameters include at least one of current (mA), and size of focal spot; and

wherein the current is formed by said electrons emitted from said electron source.

19. (canceled)

20. (original) An x-ray apparatus in accordance with claim 16, wherein said x-ray imaging system comprises one of: a) a radiographic film defining an image plane; and b) a flat panel detector disposed along an image plane and configured to detect x-rays that have passed through the object.

21. (original) An x-ray apparatus in accordance with claim 16, wherein said one or more sensors comprise at least one of: an ionization chamber; a scintillator; and a solid state detector.

22. (original) An x-ray apparatus in accordance with claim 16, wherein the object

comprises anatomical tissue, and wherein said processor comprises:

A. means for calculating the thickness of the object;

B. means for calculating the differential attenuation coefficient of the tissue at each of said first and second kVp levels based on the output signals from said sensors and based on the measured thickness of said tissue;

C. means for providing at least one $\Delta\mu$ table for at least one region of said object; and

D. means for computing said optimal values of said x-ray exposure parameters using said $\Delta\mu$ table.